

## **REMARKS**

Claims 1, 2, 5, 7-16, 19 and 21-30 are all the claims pending in the present application.

Claims 12, 13, 25 and 26 have been amended to clarify that said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety, as recited in independent claims 1 and 14. No new matter is added.

A telephonic interview was held on Oct. 4, 2006 with Examiner Sin J. Lee, Mr. Wu-Song Huang (Applicant) and Todd M. C. Li (Attorney for Applicants). Claims 1, 12, 13, 14, 25 and 26 were discussed. The references cited in the Office Action were discussed.

Reconsideration of the rejections is respectfully requested based on the following discussion.

### **I. The Claim Objections**

Regarding claims 12, 13, 25 and 26, the Office Action alleges that the solubility-promoting group is not protected with the cyclic ketal acid labile moiety. Applicants respectfully disagree with that interpretation of the claims. Claim 1 and 14 recite, among other things, "a pendant solubility promoting moiety, ... , wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety." Thus, the pendant solubility promoting moiety is limited to being protected by the cyclic ketal acid-labile moiety. Claims 12, 13, 25 and 26 have been amended to clarify the limitation as presently recited in claims 1 and 14, specifically, that "each R<sup>6</sup> consists of said pendant solubility promoting moiety, wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety."

Applicants submit that claims 12, 13, 25, and 26 further limit the subject matter of claims 1 and 14, and respectfully request that these objections be reconsidered and withdrawn.

## **II. The 35 U.S.C. §103(a) Rejections**

The Office Action argues that Asakawa et al. teaches the equivalence of the trimethylsilyl group and 1-methoxycyclohexyl group as acid-decomposable groups and further in view of Bucchignano's alleged teaching a cyclic aliphatic ketal substituent such as a methoxycyclohexanyl group as an acid labile protecting group for an aqueous base soluble copolymer, it would have been obvious to one skilled in the art to use the methoxycyclohexanyl group as Sooriyakumaran's acid-cleavable group in his Example 3 to arrive at the present invention. Applicants respectfully disagree that it would have been obvious to one skilled in the art to use the methoxycyclohexanyl group as equivalent to the trimethylsilyl group in Sooriyakumaran's Example 3.

Applicants first note that the present application has pointed out that there are difficulties with prior art low activation groups, including acetal, ketal and orthoesters, that have been used. For example, chemically amplified photoresist compositions based on acid labile groups comprising acetals often give rise to unpredictable results (see page 7, lines 13-25). Orthoester protecting groups are relatively highly reactive, and the shelf life of the resist product would be limited (see page 8, lines 14-15). Ketal protecting groups typically have higher reaction rates in comparison to acetal systems, for example, up to a thousand times faster, however prior art ketal protecting groups are typically linear ketal groups, which have the disadvantages of having low inhibition characteristics and relatively short shelf life (see page 8, lines 17-29) (see also Cordes et al., "Mechanism and Catalysis for Hydrolysis of Acetals, Ketals, and Ortho Estors", Chemical Reviews, 1974, Vol. 74, No. 5, pp. 593, referring to Table VI on page 592, showing ketal having a relative reactivity 2,200 greater than acetal).

In addition, as disclosed in Ota et al. ("Effects of deprotected species on chemically amplified resist systems," SPIE Vol. 2195 (1994), pp. 74-83), and acetal protecting group such as tetrahydropyranyl (THP) has a higher deprotection reaction rate than trimethylsilyl ether (TMS) (see pg. 76 and Table 1). As discussed above, ketals have reaction rates on the order of a thousand times greater than acetals, and thus ketals have a reaction rate greater than a

thousand times the reaction rate of TMS. Thus, cyclic ketals would not be considered equivalent to TMS as an acid decomposable group by one skilled in the art.

Synthesizing cyclic ketal protecting groups on larger solubility promoting moieties in the structure of the present invention or Sooriyakumaran et al. is not predictable since the structure of Bucchignano et al. is different than the structure of the present invention or Sooriyakumaran et al. and will not necessarily result in the desired resist composition.

Referring to the publication by Schmaljohann et al. ("Design Strategies for 157 nm Single-Layer Photoresists: Lithographic Evaluation of a Poly( $\alpha$ -trifluoromethyl vinyl alcohol) Copolymer", In Advances in Resist Technology and Processing XVII, Proceedings of SPIE Vol. 3999 (2000), pp. 330- 334) and US Patent 5,919,597 to Sinta et al. (hereinafter "Sinta"), which Applicants have previously provided with an Information Disclosure Statement, Applicants submit as evidence that there was no reasonable expectation of success to combine the teachings of Sooriyakumaran et al., Asakawa et al., and Bucchignano et al., without undue experimentation.

In Schmaljohann et al., it was found that a protection reaction with *p*-toluene sulfonic acid as catalyst protects the acidic  $\alpha$ -trifluoromethyl alcohol groups to only a small extent, whereas more powerful neutral catalysts like ATPB give high conversion for the protection reaction (see Schmaljohann et al., page 332, Scheme 2).

On the other hand, in Sinta et al., *p*-toluene sulfonic acid is the stronger catalyst than oxalic acid or malonic acid for acid-catalyzed condensation, which can result in significant reaction exotherms and can form undesired side products. (see Sinta et al. at col. 5, lines 38-50).

Thus, in some cases, a more neutral catalyst may be the stronger catalyst (as noted by the Office Action in Schmaljohann et al.), while in other cases, a more acidic catalyst may be the stronger catalyst (as in Sinta et al.). Thus, when the structures are different, the corresponding synthesis is not predictable, and it would not be obvious to one of ordinary skill in the art to arrive at the present

invention with a reasonable expectation of success, without undue experimentation.

Thus, Applicants respectfully request that these rejections be reconsidered and withdrawn.

**CONCLUSION**

In view of the foregoing, Applicants submit that claims 1, 2, 5, 7-16, 19 and 21-30, all the claims currently being examined in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time. Should the Examiner find the application to be other than in condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below to discuss any other changes deemed necessary. The Commissioner is authorized to charge any additional fees due or credit overpayments to Deposit Account No. 09-0458.

Applicants' undersigned attorney may be reached by telephone at (845) 894-6919. All correspondence should continue to be directed to the address listed below.

Respectfully submitted,

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